ECONOMIC ANNALS, Volume LXVII, No. 235 / October – December 2022
UDC: 3.33 ISSN: 0013-3264

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TRADE MODELS IN THE EUROPEAN UNION

ABSTRACT: *By studying the factors underlying differences in trade performance across European economies, this paper derives six different "trade models" for 22 EU countries and explores their developmental and distributional dynamics. We first introduce a typology of trade models by clustering countries on the basis of four key dimensions of trade performance: endowments, technological specialisation, labour market characteristics and regulatory requirements. The resulting clusters comprise countries that base their export success on similar trade models. Our results indicate the existence of six different trade models: the 'primary goods model' (Latvia, Estonia), the 'finance model' (Luxembourg), the 'flexible labour market model' (UK), the 'periphery model' (Greece, Portugal, Spain, Italy, France), the 'industrial workbench model' (Slovenia, Slovakia, Poland, Hungary, the Czech Republic), and the 'high-tech model' (Sweden, Denmark, Netherlands, Belgium, Ireland, Finland, Germany and Austria). Subsequently, we provide a comparative analysis of the economic development and trends in inequality across these trade models. Inter alia, we observe a shrinking wage share and increasing personal income inequality in most of them, yet find that the 'high-tech model' is an exceptional case, being characterised by relatively stable economic development and an institutional setting that managed to counteract rising inequality.*

KEY WORDS: *Trade policy, cluster analysis, European Union, growth models, trade models.*

JEL CLASSIFICATION: F 10, F 16, F43, J3, J5, K2

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Highlights

- We introduce the concept of trade models to describe patterns in trade performance
- We focus on exports as a particularly important component of aggregate demand
- We describe relevant dimensions for assessing and identifying different trade models
- We empirically develop a typology of trade models among EU countries by using cluster analysis
- We study the distributional patterns accompanying different trade models

Disclosure statement

There is no potential conflict of interest.

1. INTRODUCTION

Differences in trade performance and trade policy feature prominently in public discourse as well as in discussions on the development of different growth models in Europe. The literature argues that while most European countries experienced a decrease in domestic demand due to increasing inequality from the 1980s onwards (e.g., Stockhammer, 2015; Behringer & van Treeck, 2019), those with a competitive export sector were able to counteract this trend through an increase in exports, thereby following an *export-led growth model* (e.g., Gräbner et al., 2020a). Countries lacking the international competitiveness that is necessary to follow such as export-led growth model accumulated high levels of private (and, in a few cases, public) debt to stabilise aggregate demand – a strategy that proved unsustainable once the financial and economic crisis started (Gräbner et al., 2020b). The countries with such a *debt-led led growth model* experienced protracted recessions with high socio-economic costs. The present paper complements the existing literature on growth models by introducing the concept of 'trade models': since international trade and competitiveness play such an important part in the discussion on growth models, a closer investigation of the patterns of trade and competitiveness is warranted. Thus, the present paper provides such an investigation by taking a closer look at the trade patterns of European countries, which give rise to certain specialization paths, which we call "trade models". To delineate distinct trade models, we investigate differentials in

international competitiveness, the composition of trade as well as trade policies. We also study which developmental and distributional patterns accompany the different trade models in the European Union.

In the literature on growth models, typologies are a well-established instrument for analysing commonalities and differences across countries (e.g., Simonazzi et al., 2013; Gräbner et al., 2020a; Behringer & van Treeck, 2019). These typologies group countries according to some fundamental similarities and can go beyond simple classifications by capturing systemic aspects of policy or institutional arrangements. Hence, such typologies are useful when it comes to developing the "big picture" of how identified regimes work (Ebbinghaus, 2012; for a methodological discussion see also Gräbner-Radkowitsch, 2022). In the present case, our main interest is to highlight the different strategies countries pursue to achieve success in international competition, and to ask whether these strategies are accompanied by consistent developmental and distributional patterns.

To this end, we develop a typology of trade models among EU countries by applying hierarchical clustering tools to a selection of factors derived from theoretical considerations which allow us to describe different strategies of developing a trade model. We identify six different country clusters in the European Union, with each cluster representing a different trade model. The factors used for the clustering were extracted from the existing literature and comprise the dimensions of *natural endowments, technological capabilities, labour market characteristics* and *the regulatory environment*. It also turns out that the trade models we identify are accompanied by different – but within each trade model consistent – developmental and distributional patterns.

The rest of this paper is structured as follows. In the next section we clarify our theoretical vantage point and delineate trade models using a hierarchical cluster analysis. In section 3, we discuss the developmental and distributional patterns that accompany different trade models. Section 4 discusses the findings and offers concluding remarks.

2. TRADE MODELS IN THE EUROPEAN UNION: THEORETICAL AND EMPIRICAL CONSIDERATIONS

In this section, we clarify our theoretical vantage point and introduce the concept of trade models (2.1), justify the factors we use to delineate different trade models (2.2), describe the details of the clustering approach (2.3) and present its results (2.4).

2.1. Growth models and trade: different determinants of export success

Our theoretical vantage point is the literature on theories of path-dependency in economic development (Myrdal, 1958; Krugman, 1991). Kaldor (1980) argues that past "success breeds further success and failure begets more failure", and this may lead "to a 'polarisation process' which inhibits the growth of such [manufacturing, the authors] activities in some areas and concentrates them in others." Consequently, from a political economy perspective, economic development can be considered as a path dependent process, so that countries may be classified according to their structural characteristics (e.g., Celi et al., 2018; Iversen et al., 2016; Gräbner-Radkowitsch, 2022). In its classical structuralist interpretation, such classification[1] distinguishes between 'core' and 'periphery' countries, where the main idea is that both political and economic power are distributed strongly in favour of the core. The reasons for this asymmetry may be long-term: Ahlborn and Schweickert (2019), for instance, point out that economic systems in developing countries are still determined by their colonial heritage.

An area in which such typologies have been used extensively in the more recent past is the analysis of different 'growth models'. The growth model literature classifies countries according to their demand drivers of economic growth (e.g., Baccaro & Pontusson, 2016; Hope & Soskice, 2016; Regan, 2017). Export-led growth refers to a strategy where exports serve as the main driver of growth and

[1] The analytical use of country typologies has a long tradition in comparative social sciences: Esping-Andersen (1990) was among the first to develop a prominent typology of welfare states, suggesting a distinction between 'liberal', 'conservative', and 'social-democratic' welfare states. Typologies are also a prominent tool in the comparative analysis of economic systems. An example is the Varieties of Capitalism (VoC) approach pioneered by Crouch and Streeck (1995) and Hollingsworth and Boyer (1997), which categorises market economies as a whole rather than only with regard to their welfare state apparatus.

companies may substitute foreign demand for a potential lack of *domestic* demand. Export-led economies, therefore, typically export more goods and services than they import, and these net exports coincide with net capital outflows. Debt-driven growth, on the other hand, refers to a process in which a demand for credit (in the private sector) is met by corresponding credit supply, and increasing (private sector) debt serves as the main growth driver, so that these economies are prone to experiencing (debt-fuelled) asset-price bubbles in boom times and vulnerable to suffering from sudden stops in capital inflows in bad times, as such stops will typically trigger deleveraging processes that hinder economic growth. The literature points out that developmental paths throughout the EU have been shaped by these strategies to different degrees, with export-based expansion prevailing in some countries and private debt-led models in others (e.g., Stockhammer & Wildauer, 2016).

This paper complements the literature on growth models by introducing the concept of *trade models*, which aims to capture the different strategies countries pursue to achieve success in international competition. While the growth model literature refers to cross-country trends regarding the impact of different components of aggregate demand on the observed growth performance, we focus on one particular aspect of aggregate demand that has received considerable attention in the literature on Europe, namely exports. We thereby hypothesise that the resulting trade models closely align with existing typologies of growth models as we assume that trade performance is not determined exogenously, but rather is intrinsically connected to the overall properties of different growth models.

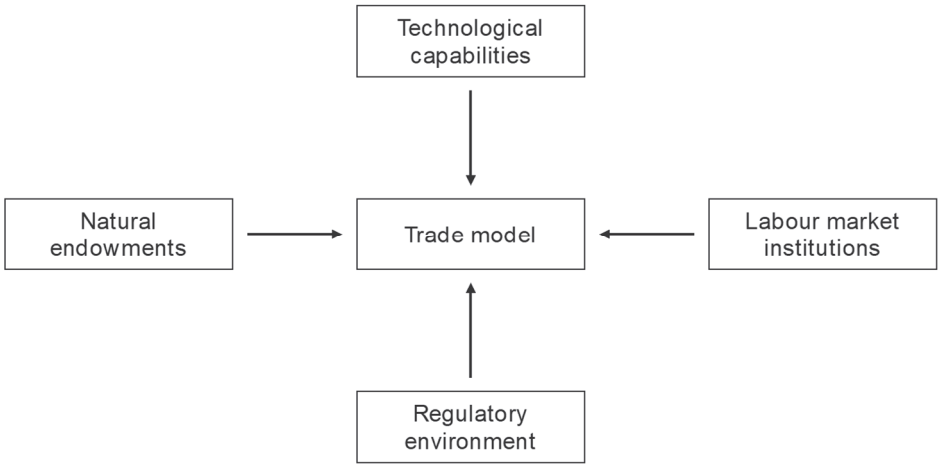
As a consequence, we opt for an empirical approach to assess this claim by employing a hierarchical clustering approach. In doing so, we systematically account for factors that shape different strategies for achieving success in international competition and thereby affect the possibility for a country to follow an export-led growth model. This strategy will highlight similarities among countries belonging to specific groups in terms of the factors that shape their success on international markets. Notably, our approach does not suggest a mono-causal relationship running from trade models to growth models, economic development and distribution. Rather, the causality may actually run in both directions. Therefore, our contribution is descriptive in the sense that we

systemise the different trade models in the Europe and in the process describe one important aspect of growth models in considerably more detail than the literature has been doing so far.

2.2. Dimensions of trade models

Any delineation of a typology must start with a selection of variables according to which countries are to be classified. In line with the existing literature, we take into account variables from four dimensions: *natural endowments*, *technological capabilities*, *labour market institutions* and *regulatory environment* (see Figure 1).

Figure 1: Dimensions of trade models.



Since Adam Smith's seminal contributions, natural endowments have been seen as a key factor in shaping patterns of trade and economic development (e.g., Barbier, 2003; Dosi & Tranchero, 2018; Wright, 1990). Possessing scarce resources needed for further processing represents an advantage for a given country. The developmental implications of such resource endowments are, however, mixed: while countries such as Norway or Saudi Arabia have acquired considerable wealth due to their natural endowments, many other resource-rich countries remain poor, either because of negative exchange rate effects (à la the *Dutch disease*) or because of increased corruption and social conflicts, which often result from personal short-term gains related to resource appropriation.

The importance of technological capabilities for trade performance has been highlighted in a number of recent studies (e.g., Dosi et al., 2015; Gräbner et al., 2020b; Storm & Naastepad, 2015a, 2015b Storm & Naastepad, 2015). The accumulation of technological capabilities usually comes with positive developmental implications. Lee (2011), for instance, analysed 71 countries and showed that those countries exporting high technology products grew more rapidly than countries exporting low or medium technology products. For Hidalgo (2015), technological capabilities are the ultimate source of economic development, a view motivated by recent contributions to the science of economic complexity (Cristelli et al., 2015; Felipe et al., 2012; Hidalgo & Hausmann, 2009; Tacchella et al., 2013).

The third set of variables is concerned with labour market institutions and labour market outcomes. The relevance of institutions that ensure relatively low unit labour costs as a key source of international competitiveness is regularly highlighted (Chen et al., 2012; Cuñat & Melitz, 2012; Lapavitsas et al., 2011; Samuelson, 2004).[2] Consequently, boosting export-led growth is said to require more labour market flexibility, which implies the need to reduce employment protection legislation, unemployment benefits and the influence of trade unions. In more general terms, however, strong labour market institutions can also be seen as a protection of employees from the uncertainty caused by globalisation and are able to explain a large part of cross-country differences in income inequality and wage mobility (Aristei & Perugini, 2015; Esping-Andersen, 1990; Crouch & Streeck, 1995; Hall & Soskice, 2001). Rodrik (1996) and, more recently, Manow (2018) argue that the well-developed welfare state is mainly a promise to compensate potential losers of international trade.

The final category of variables more broadly covers the regulatory environment of countries. The ability of a country to attract international investments and/or incentivise firms to migrate to that country is considered a major determinant for international competitiveness. A common line of argument relates this ability to low corporate taxes and loose regulations. Being aware of their significance for

[2] The actual relevance of low labour unit costs for relative export-success, however, is surrounded by many doubts. A typical counterargument is that labour market flexibility and low labour unit costs mainly reduce domestic demand as well as imports and thus contribute to increasing trade surpluses (Flassbeck & Lapavitsas, 2013).

job creation and international competitiveness, firms influence the political discourse and try to avoid new regulations. In a highly interconnected global economy, however, politicians try to convince firms to stay in a respective country by relocating the tax-burden or by weakening regulatory requirements, especially for the financial sector. This setup can lead to a general race to the bottom in regulatory standards (e.g., Carruthers & Laboureaux, 2016; Egger et al., 2019; Kapeller et al., 2016) and foster distributional conflicts (Baccaro & Pontusson, 2016). In the following, these four (to some extent conflicting) sources of trade competitiveness are used to delineate different growth models.

2.3 Data and Method

To develop a typology of trade models, we compose a data set for EU countries that comprises indicators for all four main dimensions of competitiveness highlighted in the previous section for the time period between 1995 and 2017 (see Table 1).[3] We operationalise the dimension of endowments via the employment share in agriculture, the share of oil in total exports, the share of general primary goods in total exports, the share of value added coming from manufacturing, and natural resources rents (in % of GDP).

To address the complexity of technological capabilities, we refer to the gross domestic expenditure on R&D and government expenditure on education as indicators for how countries foster the development of high technology products through education and research. Furthermore, the capital share of information and communication technology in relation to GDP (ICT) and employment in the industrial sector are used to proxy for the economic structure of countries. Finally, the index of economic complexity (Hidalgo & Hausmann, 2009) is used as a proxy for the number of technological capabilities accumulated within a given country.

[3] The raw data has been published as Gräbner-Radkowitsch et al., (2019). For a general overview see the appendix. The code used to create the results and figures in the paper is available via Github: https://github.com/graebnerc/trade-typology.

Table 1: *Indicators and Dimensions of the trade models.*

Dimension	Indicator	Unit
Natural endowments	Employment in agriculture	Share of total employment
	Natural resources rents	Share of GDP
	Oil	Share of total exports
	Primary goods	Share of total exports
	Share of value added from manufacturing	Per cent of GDP
Technological capabilities	Economic complexity index	Index
	Employment in the industrial sector	Per cent of total employment
	Government expenditures on education	Per cent of GDP
	Gross domestic expenditure on research and development	Per cent of GDP
	ICT capital share in GDP	Per cent of GDP
Labour Market	Adjusted wage share	Per cent of GDP
	Average wages per year	PPP Dollar
	Coordination of wage setting	Index
	Strictness of regulation on dismissals and the use of temporary contracts.	Index
	Unemployment benefit net replacement rates for single earner in initial phase of unemployment	Per cent
Regulatory environment	Corporate Tax	Tax revenue as per cent of GDP
	De jure component of the KOF econ index	Index
	Foreign direct investment (FDI)	Per cent of GDP
	Share of financial sector in gross output	Per cent of all sectors
	Taxes on estates and other wealth taxes	Tax revenue as per cent of GDP
	Taxes on estates and other wealth taxes	Tax revenue as per cent of GDP

To operationalise the dimension of labour market institutions, we consider employment protection legislation and the net replacement rate of unemployment benefits. We also include an index for the coordination of wage bargaining since the literature suggests that wage moderation – which is considered a major determinant for export success – requires a high degree of wage coordination (Traxler et al., 2001). As an indication of a low labour cost strategy, we use two indicators: average national wages and the adjusted wage share. A low or a decreasing wage share would mean that employees benefit less from economic growth and from international trade than owners of assets.

Finally, with regard to the dimension of the regulatory environment, we use the revenues of three categories of taxes (as per cent of GDP) which are relevant for companies' (re)location choices: corporate taxes, estate taxes and all other wealth taxes. Furthermore, the share of the financial sector in gross output and foreign direct investment (FDI) in relation to GDP are included as indicators for capturing deregulation strategies that are geared towards attracting foreign investments, and the KOF de jure index measures the strictness of regulation with respect to economic openness.

Due to data limitations, particularly with regard to labour market institutions and tax revenues, our analysis takes into account OECD countries only. Moreover, since tax data are not available for Lithuania, we cannot consider this country. Therefore, we end up with a data set for 22 EU countries for the period between 1994 and 2016.

We derive our typology via the use of a hierarchical clustering algorithm, a well-established tool from unsupervised machine learning. We chose to rely on hierarchical methods since the resulting dendrograms will allow us to further interpret the similarities and dissimilarities between members of the various clusters. In a first step, we remove all missing data points and average all variables for each country over time. Then the variables are z-transformed, and a clustering algorithm is applied. Here we use the (agglomerative) WARD-method (Everitt et al., 2001), which minimises the variance within groups and maximises their homogeneity. As indicated by Table 2, the WARD algorithm is the most appropriate algorithm for the data we use.

Table 2: *Comparison of the performance of different hierarchical clustering algorithms. The higher the clustering coefficient, the more appropriate the algorithm.*

	Algorithm	Clustering coefficient
1	Agglomerative clustering – Ward's method	0.98
2	Agglomerative clustering – Complete linkages	0.96
3	Divisive clustering	0.96
4	Agglomerative clustering – Average linkages	0.93
5	Agglomerative clustering – Single linkages	0.76

2.4. Results

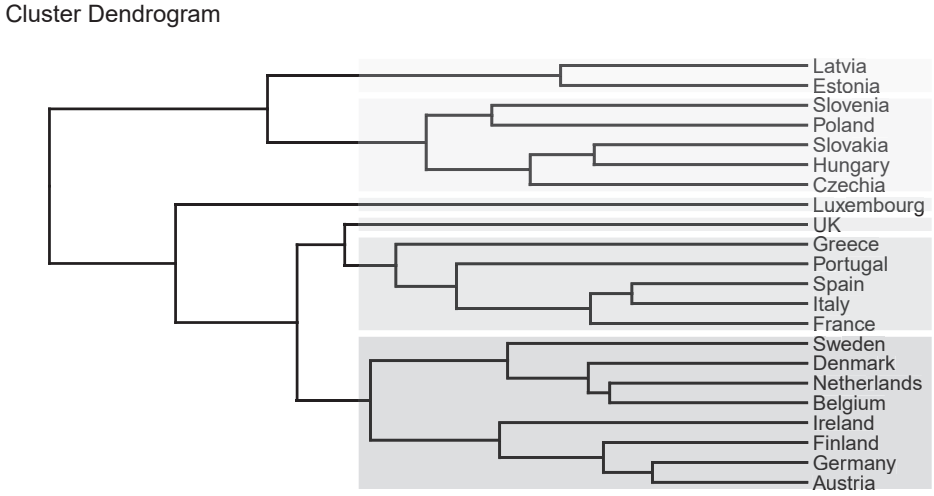
Based on our hierarchical cluster analysis, we identify six different types of trade models for the 22 EU countries (see Figure 2). Their distinguishing characteristics are summarised in Table 3.

The first cluster comprises the two Baltic countries Latvia and Estonia. Due to the importance of primary goods for exports and the total economy, we label this trade model the 'primary goods model'. Natural resources rents amount to 1.4 % of GDP, which is two to three times higher than in the other models. Primary goods are responsible for almost 24% of all exports, with oil alone accounting for 14%. Both values exceed those of the other clusters by several orders of magnitude. The importance of the primary sector in this cluster also becomes visible when comparing the employment share in agriculture, which is much higher in this cluster than in the rest of the sample. In the dimension of technological capabilities, this trade model exhibits the lowest value of economic complexity and the smallest expenditure on research and development. At the same time, the industry sector plays an important role in the employment structure of these countries, most likely because of the important (but technologically inferior) oil industry. Government expenditures on education, on the other hand, are surprisingly high (6.2% of GDP). Interestingly, this cluster has the second highest ICT capital share. In the labour market dimension, this trade model is characterised by a very low degree of wage coordination, low average wages and a low wage share. The very low corporate, estate and all other wealth

tax revenues are remarkable, pointing to the usage of tax arbitrage to attract foreign investments.

The second cluster consists only of Luxembourg, which distinguishes itself from all the other countries by the vast size of its financial sector, which amounts to 34.7% of total gross output, at least 15 times more than in the other clusters. Therefore, an obvious label for this trade model is the 'finance model'. The regulatory environment is attractive for foreign investors and companies, which can be seen from the largest share of FDI, the highest corporate tax revenues and the highest degree of (de jure) economic openness. Luxembourg is therefore a prime example of weak regulation boosting the financial sector and attracting foreign investments (Zucman, 2015). ICT technologies seem to be important in this case, while primary goods and natural resource rents do not play a notable role. Interestingly, unemployment benefits are relatively high, which implies that the welfare state tries to compensate potential losers of globalisation in the case of unemployment.

Figure 2: Result of the hierarchical clustering.



The trade model of the United Kingdom (UK) seems to be a particular case with few similarities to the other trade models as well. The UK is mainly characterised by a highly deregulated labour market and high economic complexity. Therefore, we call this cluster the 'flexible labour market model'. On average, people receive

only around 19.4 % of their former net income in the case of unemployment, and employment protection is very low. The coordination of wage settings is underdeveloped, reflected in a fragmented wage bargaining structure confined largely to individual firms or plants. This trade model is obviously geared towards a deregulated labour market strategy in favour of firms, with little job security and benefits for employees. Against this backdrop, the observation that both average wages and the wage share are quite high seems to be surprising at first. Yet, these high values are mainly due to employees in the financial sector in London who obtain extremely high incomes (and, therefore, contribute to the high estate and wealth tax revenues), a fact that manifests itself in very high levels of income inequality (Denk, 2015).

The fourth model comprises the remaining Eastern European countries (Slovenia, Poland, Slovakia, Hungary, the Czech Republic). This model has the highest share of manufacturing in GDP and employment relative to all the other clusters. At the same time, primary goods play a minor role in exports in this trade model. We call this model the 'industrial workbench model' since it is obviously specialised in the manufacture and processing of industrial products, but mainly with regard to intermediate goods; the Visegrad countries, in particular, are strongly integrated into global value chains and the European industrial core around Germany (Stöllinger, 2016). This significant position also becomes visible in the dimension of technological capabilities as indicated by these countries' high scores for economic complexity. This cluster seems to have an intermediate position between the primary goods model (cluster 1) and the high-tech model (see cluster 6 below), also with respect to the level of wages. The lowest value of (de jure) economic globalisation (de jure component of the KOF index) is remarkable given the important role of this cluster for the European industrial production chain.

Table 3: *Mean values of the identified trade models. Highest values are bold; lowest values are in italics.*

	Cluster 1 Primary goods (LV, EE)	**Cluster 2 Finance** (LUX)	**Cluster 3 Flexible labour market** (UK)	**Cluster 4 Industrial workbench** (SI, PL, SK, HU, CZ)	**Cluster 5 Periphery** (GR, PT, ES, IT, FR)	**Cluster 6 High tech** (SE, DK, NL, BE, FI, DE, AT, IE)
Endowments						
Employment in agriculture	**13.71**	1.94	***1.41***	8.34	8.08	3.89
Share of oil in total exports	**0.14**	***0.00***	0.08	0.02	0.03	0.03
Share of primary goods in total exports	**0.24**	0.09	***0.08***	0.09	0.17	0.14
Natural resources rents in % of GDP	**1.44**	***0.05***	0.75	0.56	0.11	0.39
Share of manufacturing in % of GDP	13.71	***7.57***	11.19	**19.79**	12.97	17.23
Technological capabilities						
Economic complexity	***0.60***	1.27	**1.80**	1.37	0.94	1.67
Employment in industry	**29.14**	***17.77***	22.69	35.41	26.34	24.79
Gross domestic expenditure on research and development in % of GDP	***0.85***	1.48	1.63	1.08	1.20	**2.37**
ICT capital share in GDP	3.85	**3.88**	3.22	3.30	***2.82***	3.36
Government expenditure on education in % of GDP	**6.21**	4.98	5.31	5.17	***4.96***	5.58

Labour market institutions						
Coordination of wage setting	1.19	2.38	***1.00***	2.12	2.75	**4.08**
employment protection legislation	2.40	2.25	***1.20***	2.45	**2.92**	2.30
Unemployment benefit net replacement rates in %	69.18	**82.93**	***19.40***	62.37	65.17	66.92
Average wages per year PPP Dollar	***15,950***	**55,570**	40,390	21,640	33,400	43,720
Adjusted wage share in %	***56.50***	58.17	63.20	57.78	62.19	**62.57**
Regulatory environment						
Corporate tax revenue as % of GDP	***1.70***	**5.88**	3.12	2.65	3.41	3.06
Estate tax plus all other wealth tax revenue as % of GDP	***0.55***	2.26	**2.95**	0.55	1.27	0.77
Foreign direct investment (FDI) to GDP	6.17	**41.03**	3.95	6.46	***1.95***	8.11
Share of financial sector in gross output	***1.83***	**34.65**	4.93	1.87	2.59	2.96
De jure component of the KOF globalisation econ index	80.47	**88.99**	88.26	***67.66***	82.17	85.47

The fifth trade model consists of the Southern European countries Greece, Portugal, Spain, Italy and France. Even though agriculture represents an important employment sector, the relevance of primary goods in this 'periphery model' is lower than in the primary goods model. The technological capabilities in the periphery model are less well developed than in the other trade models with the exception of the primary goods model. Moreover, the periphery model

exhibits the smallest ICT capital share and the lowest government expenditures on education across all trade models. Also, the degree of economic complexity, the total output of industry and the gross domestic expenditures on R&D are rather low. This combination of poor technology, low investments in education and strict employment protection legislation seem to provide an unattractive setting for foreign direct investments. As a consequence, this trade model is most strongly constrained by the fact that currency devaluations became impossible after the introduction of the euro as a shared currency.

Finally, the sixth model comprises Sweden, Finland, Denmark, Netherlands, Belgium, Ireland, Germany and Austria. These countries distinguish themselves from the others mainly in the dimensions of technological capabilities and labour market institutions. These eight countries have the highest R&D investments and also show a high degree of economic complexity. Because of their international competitiveness, particularly with regard to complex products requiring a high level of technological capabilities, we term this model the 'high-tech model'. The high expenditures on R&D and education suggest that this trade model is characterised by an active role of the state in a mixed economy. Most prominently, Mazzucato (2013) has already pointed out the relevance of the interaction between the state and private firms when it comes to fostering innovation and technical developments. The high-tech model also stands out from the others due to the highest degree of wage coordination and relatively high wage shares (Sorge & Streeck, 2018). The main trade strategy in this cluster is to produce internationally competitive complex products of high quality. To do so, not only are large investments in research and development necessary but also an environment that fosters education and research in a bargaining relationship based on trust between labour- and capital-related institutions (e.g., Zhou et al., 2011; Kleinknecht et al., 2013). The links between a corporatist (Traxler et al., 2001) inclusion of societal interests in public decision-making in coordinated market economies and its positive impact on productivity and innovation outcomes has also been documented extensively (e.g., Hall & Soskice, 2001; Storm & Naastepad, 2009).

By focusing on the overall positioning of economies in globalised markets, we find some similarities, but also differences, to previous studies. Our typology suggests that categorising Europe into core and periphery countries (e.g.,

Galgóczi, 2016: Laffan, 2016; Sepos, 2016) could be too simplistic when it comes to trade models in the EU. However, to some extent the distinction between core and periphery is also visible in our results, as the periphery model and the high-tech model have a series of features that resemble those typically attributed to core and periphery countries. Nonetheless, our suggested typology is closer to the findings of Gräbner et al. (2020a), who consider more than two groups. Taking a closer look reveals that countries with similar path dependencies in their development also share a similar trade model. There are some differences in the composition of the group, however, which are most likely due to Gräbner et al. (2020a) also considering more macroeconomic benchmark variables, such as debt per capita, GDP growth and unemployment, while our focus is exclusively on trade-related factors.

3. SOCIO-ECONOMIC DEVELOPMENT IN DIFFERENT TRADE MODELS

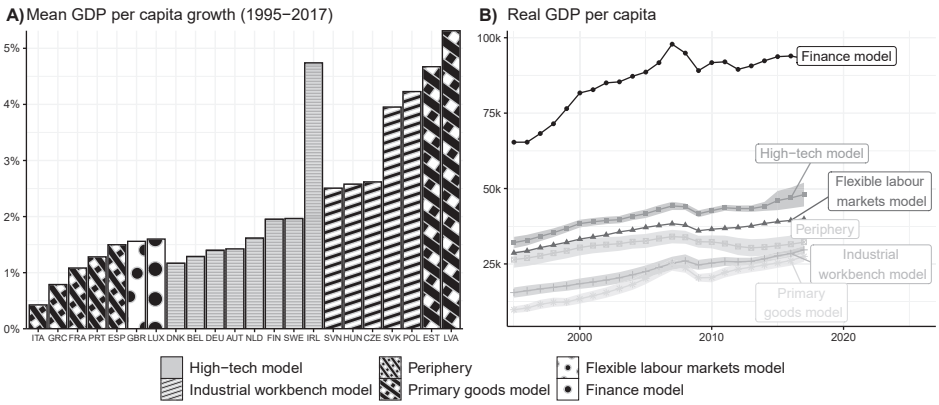
In what follows, we study whether particular trade models tend to be accompanied by specific patterns of socio-economic development, particularly growth and employment (3.1), trade performance (3.2) and inequality (3.3).

3.1. Growth and employment

The highest growth rates in terms of GDP per capita can be observed in the Baltic countries, although these countries were hit particularly hard by the financial crisis in 2007 and thereafter (see Figure 3). The only exception is Ireland; the growth rates of Ireland are, however, hard to interpret because of statistical problems in national accounting that result from the restructuring activities of Irish-based multinationals (e.g., Beesley, 2017; Linsi & Mügge, 2019). The average growth rate of the Baltic countries exceeds those of the other trade models considerably, with the two countries following the primary goods model clearly taking the lead – albeit with a relatively volatile development path and relatively low absolute levels of income. Given the importance of the primary sector in these countries, this is hardly surprising. Countries following the industrial workbench model also experienced exceptional growth rates, which can most likely be traced to the effects of increasing returns associated with accelerating industrialisation in conjunction with a stable employment structure in these countries (see below). As Figure 3b indicates, these high growth rates are, however, at least to some extent, also due to the low absolute values of their GDP per capita: the Eastern

countries are still the poorest in our sample and have so far only managed to catch up to the countries in the periphery, which have experienced by far the lowest growth rates of all the countries.

Figure 3: *Growth of real GDP per capita (PPP). Source: World Bank; own calculations.*

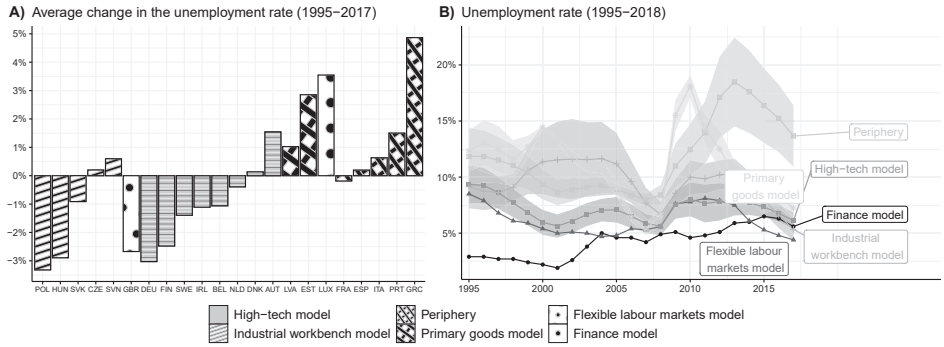


Between these extremes, we find the countries following the high-tech model, the flexible labour market model and the finance model. All these countries – despite following very different trade models – experienced similar growth rates from 1994 onwards, although the focus on finance in Luxembourg led to a much more volatile development. When considering the levels of GDP per capita, the exceptional state of affairs in Luxembourg becomes obvious. In addition, we also note significant higher per capita incomes in the high-tech cluster as compared to the flexible labour market model.

Given that labour market institutions played an essential role in delineating the different growth models, we might expect employment dynamics between trade models to be different. Figure 4a confirms this conjecture by suggesting a kind of dichotomous polarization across trade models: unemployment fell considerably in the countries following the industrial workbench model, indicating that they were harvesting the benefits of their successful industrialisation (although regional differences continued to play a role). The flexible labour market model and the high-tech countries also managed to reduce unemployment significantly, the former mainly through a very flexible labour market with strong incentives to

accept work, the latter mainly through their competitiveness in terms of technological capabilities and a strong export industry.[4] On the other hand, unemployment grew considerably in the finance model, but this is mainly the result of an exceptionally low unemployment rate in the year 1994, the lowest of all the models. The high increase in unemployment in the countries following the primary goods model is more serious. This indicates that – despite rising incomes in the past – these countries faced the challenge of structural change to more future-fit industrial sectors. The by far worst development of employment can be observed in the periphery countries, who not only faced severe problems of international competitiveness, but above all suffered from harsh austerity measures and a continuing recession after the financial crisis.

Figure 4: *Unemployment rate in per cent. Source: AMECO; own calculations.*



The relevance of the crisis in shaping employment patterns becomes obvious when inspecting Figure 4b. While there are some convergence tendencies of the unemployment rate until the year 2007, countries following different trade models showed very different reactions to the financial crisis: all countries experienced a spike in unemployment, but this effect was barely noticeable in Luxembourg, was rather moderate in the high-tech, industrial workbench and the flexible labour market models, and extreme for the countries following the periphery and the primary goods models. Compared to the latter, the periphery

[4] Even so, Germany also introduced restrictive labour market reforms (the "Hartz Reforms", see, e.g., Mohr, 2012), which put high pressure on unemployed and led to wage moderation. Its superior technological competitiveness, however, still seems to be the main determinant for its export success (Storm & Naastepad, 2015a, 2015b).

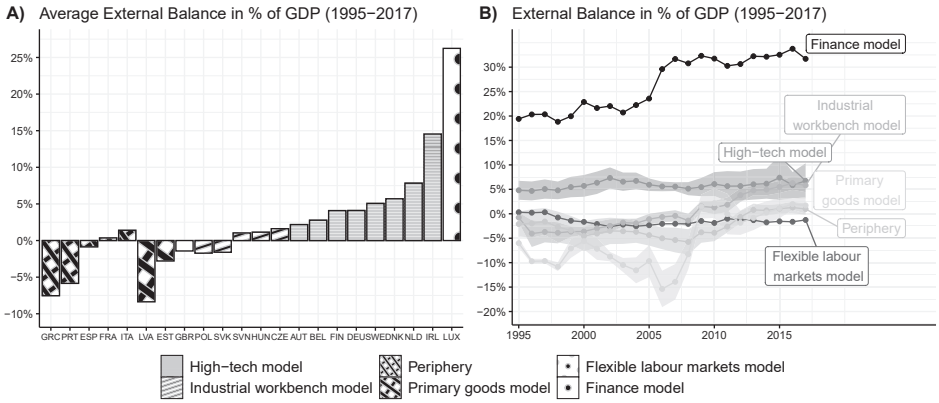
barely recovered from this shock and still experiences by far the highest unemployment rates of all the countries. The countries following the primary goods model managed to recover to some extent, but still record significantly higher unemployment rates than the rest, including the other Eastern European countries following the industrial workbench model, the strong industrial sector of which seems to be a better job provider than the primary goods sector in Latvia and Estonia. The remaining clusters (high-tech, finance and the UK) now all experience similar levels of unemployment.

3.2. Trade performance

We now assess the various trade models with regard to their external balance.[5] As shown in Figure 5a, it is mainly Luxembourg and the countries following the high-tech trade model that achieve a positive current account balance on average, although as the result of different mechanisms. The constant current account surplus in the high-tech countries is most likely due to their advanced industrial sectors being capable of producing complex products that face less competition, but enjoy stable demand, as compared to the technologically less sophisticated products produced by the periphery countries or those following the primary goods model. The latter two groups show the worst average current accounts, with only Spain and Italy being the exceptions. This has to do with the regional polarization within these countries: in Spain, for example, companies in the north have a strong position in the world markets and contribute positively to the current account of Spain as a whole. But the south of Spain is scarcely industrialised, and companies possess only few technological capabilities. A similar divide can be observed within Italy. The positive trend since the financial crisis (Figure 5b) can be traced back to shrinking imports, which themselves are due to a considerable reduction in citizens' disposable income. The industrial workbench countries improved their external balance, indicating that their newly established industries are increasingly competitive on international markets.

[5] Most of what can be said about the external balance, which is defined as the difference between exports and imports of goods and services expressed as a share of total GDP, is equally true for the current account balance of the countries more generally.

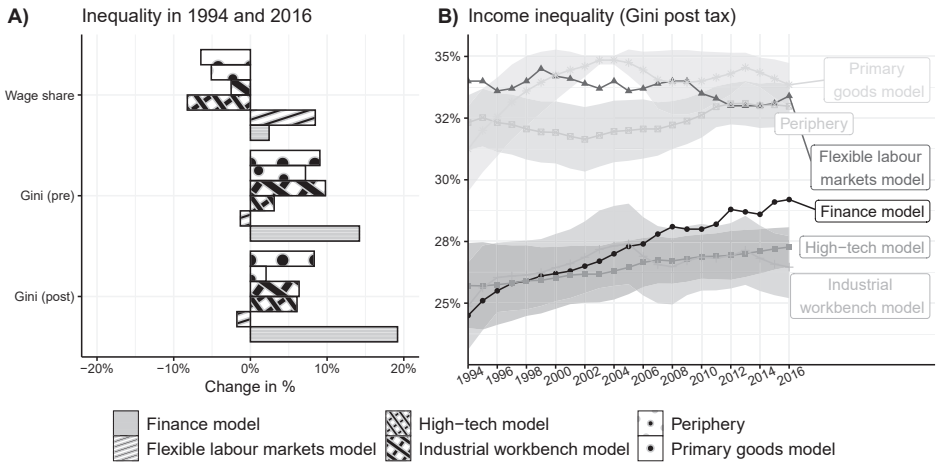
Figure 5: *Trade balance in % of GDP. Source: World Bank.*



3.3. Inequality

Finally, we study whether different trade models are also accompanied by distinct inequality dynamics. With regard to the functional income distribution, we observe a reduction in the wage share in all the trade models except for the UK and the finance model, indicating that in most trade models, employees did not benefit markedly from economic growth and increasing international integration (see Figure 6a). The exceptional role of Luxembourg and the UK is most likely due to the many well-paid jobs in the large financial sectors of these countries. Because of their different economic structures, this does not imply a high level of personal inequality in Luxembourg, where the vast majority of the population enjoys high salaries, but it does so for the UK: here the well-paid employees are concentrated in the South, particularly in the City of London, whereas the North in particular is characterised by lower wages and higher unemployment. This becomes immediately obvious in the right panel of Figure 6, where the UK belongs to the group of very unequal clusters, while Luxembourg still enjoyed moderate levels of income inequality, although it had suffered from the most pronounced increase in personal income inequality since 1995 and exceeded the high-tech and industrial workbench countries, whose levels of personal income inequality remained moderate as compared to the other trade models.

Figure 6: *Development of wage-share and Gini index between 1994-2016. Source: AMECO for the wage share and Solt (2019) for inequality data.*



The consideration of inequality highlights important differences between the trade models that appeared to be similar in terms of their growth and employment dynamics (5.1) and foreign trade performance (5.2): for instance, while the industrial workbench economies still enjoy comparatively low levels of inequality, inequality is high in the countries following the primary goods model despite both models enjoying respectable growth rates of GDP per capita. Here, the low unemployment rates and the less volatile development dynamics associated with the focus on industrialisation inherent in the industrial workbench model seem to be important parts of the explanation. In addition, while the UK at first sight seems to be similar to the countries following a high-tech trade model, the focus on the production of high-tech products comes with significantly lower levels of inequality than the focus on flexible labour markets and a concentrated financial sector in the UK.

4. DISCUSSION

In this paper, we complement the literature on growth models in Europe by systematically analysing one component of aggregate demand that has featured particularly prominently in the literature so far: international trade. Building on the four theoretical dimensions – natural endowments, technological capabilities, labour market characteristics and regulation – we have delineated a typology of

trade models in 22 EU countries. Based on 20 variables, we have used a hierarchical cluster analysis to identify six trade models in the EU: the 'primary goods model' (Latvia, Estonia), the 'finance model' (Luxembourg), the 'flexible labour market model' (UK), the 'periphery model' (Greece, Portugal, Spain, Italy, France), the 'industrial workbench model' (Slovenia, Slovakia, Poland, Hungary, the Czech Republic), and the 'high-tech model' (Sweden, Denmark, Netherlands, Belgium, Ireland, Finland, Germany and Austria).

This typology complements previous findings from the existing literature. As expected, our results align well with existing typologies of growth models (e.g., Gräbner et al., 2020a), which underlines the observation that trade models and growth models are closely related and subject to a process of co-evolution. Most strikingly, the countries that follow the high-tech model in our case are almost identical to those that Gräbner et al. (2020a) consider as core countries, and the periphery in their study is almost the same as in our analysis of trade models. This suggests that trade models strongly relate to the more general positioning of a country within the political economic environment of the EU. We also find some similarities to the results of Esping-Andersen (1990), although our focus on trade patterns differs from their focus on welfare regimes. The flexible labour market model resembles the liberal regime (United States, Canada, Australia) in Esping-Andersen (1990) with respect to their composition and welfare state characteristics. Furthermore, the high-tech model shares some similarities with the social democratic regime of Esping-Andersen (1990) but also includes conservative countries such as Germany and Austria.

Our trade typology also complements the literature on technological capabilities and regulation. One result that stands out is that the high-tech model is characterised by a large stock of technological capabilities and that it seems to provide institutions and a political setting ensuring stability even in times of economic turmoil, as indicated, for instance, by the relatively stable GDP growth and unemployment rates during and after the 2008/2009 crisis. At the same time, the high-tech model shows one of the highest wage shares and the lowest income inequality of all the trade models in Europe. Thus, lower inequality does not necessarily hamper economic performance or trade, and there is an alternative to wage moderation when it comes to achieving international competitiveness and economic prosperity. A possible explanation is the relationship between

economic growth and the economic complexity of a country. According to Hidalgo and Hausmann (2009), economies that produce and export more complex goods also follow a sustained growth path that leads to higher prosperity than in countries that produce simpler products. In order to facilitate the development of a more complex product pool, the state has an essential role to play when it comes to fostering collective knowledge, human capital accumulation and setting the legal and institutional framework in a way that allows for improving an economy's capabilities for innovation (Felipe et al., 2012; Mazzucato, 2013). Our results indicate that labour market institutions, an active government and investments in R&D may play an important role in achieving these goals.

Finally – and obviously – this paper leaves room for further research. One possible extension would be to analyse how trade patterns have changed over time. In developing our trade models in the EU, we have used data from 1994 to 2016. Due to the introduction of the euro during this period, it is reasonable to assume that some economies changed their trading strategies as well as their institutional settings. Unfortunately, most of the relevant OECD data are only available after a country has joined the OECD. Consequently, available data are very limited for new OECD countries. Further research on the development of trade models on the basis of improved data availability could provide a better picture of how trade models change over time. And while another interesting task would be to analyse political developments in the context of trade models, we hope that in its present form, the paper has already helped to highlight some important differentials in trade patterns among European economies in the recent past.

Acknowledgments

The authors gratefully acknowledge funding from the Oesterreichische Nationalbank (OeNB, Anniversary Fund, project number: 17383). CGR also acknowledges funding from the FWF under grant ZK 60-G27. We also thank Johann Bacher for his helpful comments on cluster analysis and one anonymous reviewer for her helpful comments. The usual disclaimer applies.

Disclosure statement

There is no potential conflict of interest.

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Received: August 02, 2022
Accepted: November 25, 2022

APPENDIX

A. Data Sources

Data used for the clustering		
Indicator	**Unit**	**Source**
Employment in agriculture	Share of total employment	World Bank (Indicator: SL.AGR.EMPL.ZS)
Oil exports[6]	Share of total exports	The Atlas of Economic Complexity
Primary goods	Share of total exports	The Atlas of Economic Complexity
Natural resources rents	Share of GDP, current prices	World Bank (Indicator: ny.gdp.totl.rt.zs)
Share of manufacturing	Share of GDP	World Bank (Indicator: NV.IND.MANF.ZS)
Gross domestic expenditure on research and development	Percent of GDP	World Bank (Indicator: GB.XPD.RSDV.GD.ZS)
Government expenditures on education	Percent of GDP	Eurostat (Indicator: gov_10a_exp)
ICT capital share in GDP	Percent of GDP	Jorgenson and Wu
Employment in the industrial sector	Percent of total employment	World Bank (Indicator: sl.ind.empl.zs)
Economic complexity index	Index	The Atlas of Economic Complexity
Coordination of wage-setting	Index	Visser (2016) (ICTWSS Data base, version 5.1)
Strictness of regulation on dismissals and the use of temporary contracts.	Index	OECD
Unemployment benefit net replacement rates for single earner in initial phase of unemployment	Percent	OECD (Dataset: NRR)
Average wages per year	PPP Dollar	OECD (Indicator: AV_AN_WAGE)
Adjusted wage share	Percent of GDP	AMECO

[6] This comprises the products within the following SITC V2 categories: 28, 32, 35, 68, 97, 5224, 5231, 5232, and 5233.

Corporate Tax[7]	Tax revenue as percent of GDP	OECD
Taxes on estates and other wealth taxes[8]	Tax revenue as percent of GDP	OECD
Share of financial sector in gross output	Percent of all sectors	EU KLEMS
Foreign direct investment (FDI)	Percent of GDP	World Bank
De jure component of the KOF econ index	Index	Gygli et al. (2019)
Data used for analyzing development trajectories		
Growth of real GDP per capita	PPP	World Bank, own calculations (Indicator: NY.GDP.PCAP.PP.KD)
Unemployment rate	Percentage of labour force	AMECO
Current account balance	Percent of GDP	AMECO
External balance	Percent of GDP	World Bank (Indicator: NE.RSB.GNFS.ZS)
Wage share	Percent of GDP	AMECO
Gini index	Index	Solt (2019)

The raw data has been published (Gräbner-Radkowitsch et al., 2019)]. The code used to create the results and figures in the paper is available via Github: https://github.com/graebnerc/trade-typology.

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[7] This comprises the following OECD tax codes: 1120, 1200, 6100, 1300 and 5125.

[8] Other wealth taxes comprise the following OECD tax codes: 4200, 4500 and 4600.